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EMBRYOLOGY.<sup>1</sup>

RESEARCHES UPON THE DEVELOPMENT OF COMATULA.<sup>2</sup>—The important and complete observations of Barrois on the development of *Comatula* were made upon materials found at Toulon and Villa-Franca, and kept alive in cribs or boxes anchored in the harbor of Villa-Franca. He records a singular periodicity in the breeding habits of this animal. They deposit several crops of ova during a single season (April), and therefore produce several broods of young which become successively attached to the arms of the parent animals. The development of *Comatula* covers a period of seven days. On the first day oviposition, segmentation, and the formation of the blastula takes place; on the second day the gastrula and blastopore is formed; on the third day the enterocoel, intestine, water-vascular ring, etc., is formed. On the fourth the development of the visceral mass is completed; on the fifth day there occurs the displacement or rotation of the visceral mass, constituting a sort of metamorphosis; on the sixth day the skeleton is formed, and on the seventh hatching occurs.

The following general conclusions are submitted by the author at the close of the memoir — *Fundamental Homologies*. The first and one of the most important results which have been established by the foregoing studies is the proof of the homology between the peduncle of the larva of *Comatula* and the preoral lobe of other Echinoderms, between the calyx of the larvæ of *Comatula* and the body, properly so-called, of the larvæ of other Echinoderms. But, aside from this important homology, the development of *Comatula* differs in two important respects from that of other Echinoderms.

*First difference*.—In the ordinary Echinoderm-larva (*Asterias*, *Echinus*), the whole of the body, properly so-called (the entire body, save the preoral lobe and its appendages), is converted directly without any change of place into a young Echinoderm, so that the latter is found to be inserted at one edge of the preoral lobe. In *Comatula*, on the contrary, we have seen that the body, properly so-called (in other words, the calyx), is pushed towards the extremity of the embryo, so that instead of being, as in other Echinoderms, lodged at one side of the preoral lobe (otherwise the peduncle), it assumes a terminal position. Nevertheless, we also know that if the regular and normal mode of development presents

<sup>1</sup> Edited by Prof. Jno. A. Ryder, Univ. of Penna., Philadelphia.

<sup>2</sup> Recherches sur le développement de la Comatule. I (*C. mediterranea*), par Dr. Jules Barrois, Directeur du laboratoire de Villefranche. Recueil Zoologique Suisse. IV. No. 4, pp. 545-651, pls. XXV-XXX. Genève-Bale. 1888.

this difference, there is an irregular and abnormal mode of development which does not present it at all, and which, under the condition of the primitive relations of the calyx and of the peduncle, presents the same disposition as in all other Echinoderms; that is to say, that in which the calyx is inserted at one side. We are therefore led to conclude that the difference here noted is not a fundamental one, but that it constitutes a simple alteration of the primitive plan common to all other Echinoderms, resulting from fixation and which disappeared immediately after that fixation ceased to occur.

*Second difference.* — In the ordinary Echinoderm larva (*Asterias*, *Echinus*), the two peritoneal vesicles maintain their primitive situations, the one at the right and the other at the left, the dorsal face (aboral) of the future Echinoderm being formed at the expense of the portion of the larva which answers to the left peritoneal vesicle. As a result there is a singular discordance between the two faces of the adult and the two faces of the larva, which has been noted by numerous observers, and which consists in this, that the right side of the larva becomes the dorsal face, and the left side of the larva the ventral face of the adult, so that the now outlined Echinoderm is found to be placed in a transverse and a symmetrical position in relation to the preoral lobe of the larva. In Comatula, we have seen, on the contrary, that the ventral and dorsal faces of the larva correspond respectively to the ventral and dorsal faces of the adult in such a manner that the outlined adult (or calyx, in other words), instead of being placed transversely to the peduncle, occupies a symmetrical and regular position in relation to the latter.

We have seen, however, that there is not such a discordance between the positions of the dorsal and ventral aspects of the larva and adult Comatula, and that the two peritoneal sacs here, instead of maintaining their primitive position as in other Echinoderms at the right and left of the embryo, set out on the fifth day, in Comatula, to change their positions, the right sac becoming dorsal, and the left one ventral. Now, if we admit that the formation of the dorsal and ventral faces are subordinated to the position of the peritoneal sacs, we arrive at the conclusion that the displacement of the peritoneal sacs as described above, is a sufficient explanation of the differences noted at the outset.

The paper concludes with further detailed comparisons, which it is difficult to render comprehensible without reference to the original figures. Enough has been noted, however, to show the nature of these newer and more complete results of Barrois, as compared with those of Busch, Thompson, Metschnikoff, Götte and Perrier. The details of development of this most accessible of the crinoids is more fully elaborated in this memoir than in any yet

published, and on that account may be commended to the attention of students.

ON THE DEVELOPMENT OF THE COMMON STURGEON.—Having been requested by the United States Fish Commissioner, Marshall McDonald, to undertake the investigation of the sturgeon (*Acipenser sturio*), I repaired to Delaware City, Delaware, with that object in view. On the 15th of May mature eggs were found in a large female of that species, which was brought in to Mr. Anderson's float. Fortunately a ripe male was encountered at the same time, also in a living condition, from which sufficient milt was obtained for the purpose of fertilizing the eggs. The eggs were quite free in the abdominal cavity, and they ran out in somewhat the way shot would pour out of a rent in a bag, as soon as the abdomen was cut open. The germinal disk was already formed; in fact investigation disclosed the fact that the germinal disk, or area, is developed before the ovum leaves the follicle in which it is matured. Two sorts of ova were found in different individuals. In some the eggs were brownish gray or olive, in other females the eggs were very much darker and contained far more pigment. In all of them, however, the germinal area was clearly defined at one side often with a distinct round dark spot marking its centre, with a paler ring surrounding the central dark area. External to the pale ring there was a distinct dark ring, followed on its external margin by a narrow pale band, from whence the color over the vegetative pole or yolk became uniform. In the darker variety of eggs some of these rings were not so distinct.

During the first hours of development but slight external changes were observed in the form of the germinal area, but by the second day this area had become distinctly oval; the central dark patch was oval and the marginal pigmented ring also oval. The eggs had also changed shape; instead of remaining globular as they were at first, they assumed a slightly oval shape, the long axis of the oval lying parallel to the long axis of the now elongated germinal area. In the course of the third day the oval germinal area had given place to one of somewhat different configuration. Instead of being oval, the germinal area now became decidedly more elongated and rounded at either end, and constricted at the middle, somewhat like the body of a violin. The medullary groove now became visible, and on the third day was distinctly apparent. On the fourth day the head, body and tail of the embryo had been differentiated so far as to project distinctly above the level of the oval yolk sack, the tail was in fact developing as a free, flat lobe. The heart could be seen pulsating within the thin-walled pericardiac space underlying the head at the anterior end of the yolk sack. Hatching took place on the sixth day after fertilization, at which time the body, head and tail of the embryo were densely pigmented and

dark, while the pigment gradually faded out along the sides of the body where the walls of the latter were continued over the yolk sack, leaving the latter quite light beneath, or of a dirty yellow tint.

The eggs of the common sturgeon are very adhesive and must be transferred to trays formed of wire gauze or thin cotton cloth tacked to wooden frames, as soon after fertilization as possible, and spread out in a single layer. If this is not done the eggs will form large masses through which fresh oxygenated water cannot penetrate, and, as a result, those in the centre of the masses will be asphyxiated, fail to develop and become putrescent. The time occupied in handling them after fertilization should not be over twenty minutes. After two or three hours the eggs are firmly adherent to the wire cloth, thin muslin or cheese cloth, and the trays laden with eggs may be placed in running water without fear of detaching any of them, as their mucigen covering has by this time become quite coagulated and gelatinous, forming a coating over the zona radiata of irregular thickness. The zona proper is quite thin and somewhat elastic, but easily broken, so that the eggs are rather delicate in character. There is no "breathing chamber" developed such as is found in the eggs of many Teleosts. The operator must carefully guard against the appearance of fungus.—*John A. Ryder.*

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## ARCHÆOLOGY AND ANTHROPOLOGY.

TOPINARD ON THE LATEST STEPS IN THE GENEALOGY OF MAN.<sup>1</sup>—In this highly interesting lecture M. Topinard examines the evidence as to the later stages of human phylogeny, including those embraced in the series of placental Mammalia. He examines the opinions of previous writers on the subject, referring principally to Hæckel, Vogt, Huxley, and Cope. He commences by a discussion of the systematic relations of the contents of the order Quadrumana of modern authors, commencing with the lemurs. He concludes that in spite of certain well-known peculiarities, the Lemuridæ must be included in the same order as the monkeys and man, in opposition to the view of Vogt. He then considers the question as to whether the Anthropoid apes should be arranged with the Old World monkeys or with man, the former being the opinion of Cuvier, Huxley, and Vogt; the latter that of Broca

<sup>1</sup> Les dernières Etages de la Genealogie de l'Homme. Leçon de Mars, 1888; Ecole d'Anthropologie, Paris. Extract du Revue d'Anthropologie, May 1888.